



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/976,316	10/15/2001	Ki-deok Bae	Q66357	1888

7590 06/19/2003

SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W.
Washington, DC 20037-3202

EXAMINER

VINH, LAN

ART UNIT	PAPER NUMBER
----------	--------------

1765

DATE MAILED: 06/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/976,316

Applicant(s)

BAE ET AL.

Examiner

Lan Vinh

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 March 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☒ Certified copies of the priority documents have been received in Application No. 09/976,316.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. For the purpose of examination, the term "an anti-stiction layer" is defined as a layer formed of polymer, polycrystalline silicon or photoresist in page 3 of the specification, the term "one structure layer" is defined as a layer formed over the resulting structure (structure includes a sacrificial layer on an anti-stiction layer) in page 4 and fig, 2 D of the specification), the term "second etching" is defined as dry etching differs from the first etching /wet etching in page 4 of the specification, the term " to release the at least one microstructure " is defined as to form a released portion of a suspended microstructure in page 4 of the specification.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zavracky (US 5,638,964) in view of McNie et al (US 6,276,205)

Zavracky discloses a method for fabricating micromechanical switch/structure 84 suspended above a substrate (fig. 7F). This method comprises the steps of forming a polysilicon layer 80 to be removed by wet etching/ an anti-stiction layer to be removed by wet etching, forming a sacrificial layer 82 on the polysilicon layer 80/anti-stiction layer and then forming a polysilicon layer 84/ an anti-stiction layer on the sacrificial layer 82

Art Unit: 1765

(col 9, lines 47-60; col 10, lines 7-28 and fig. 7D), which reads on stacking an anti-stiction layer that is operative to be removed by wet etching one of before and after stacking the sacrificial layer. Fig. 7D of Zavracky also shows that polysilicon layer 80 (claimed anti-stiction layer) is formed on the substrate 30.

Zavracky differs from the instant claimed invention as per claim 1 by removing the polysilicon layer 80/ anti-stiction layer by wet etching instead of dry etching for preventing stiction.

However, McNie, in a method for fabricating a microelectromechanical device, teaches that polysilicon (claimed anti-stiction layer) can be etched away with wet etchant or alternately by dry etching (col 1, lines 40-41; col 4, lines 37-40). McNie also teaches that stiction problem associated with wet surface is lessened when using dry etching (col 4, lines 54-57), which reads on using dry etching for prevent stiction.

Hence, one skilled in the art would have found it obvious to modify Zavracky method by using dry etching to remove polysilicon/anti-stiction layer in view of McNie teaching because McNie teaches that the packing density of the device may be increased by the use of dry etching over that for wet etching and dry etching prevents the suspended portions of the micromechanical to stick to the other wafer or to portion of etched wafer above the cross sectional area (col 3, lines 58-60; col 4, lines 45-47)

The limitation of claim 2 has been discussed above.

Regarding claim 3, Zavracky discloses that layer 80 could be a photoresist layer/anti-stiction layer (col 9, lines 47-50)

Art Unit: 1765

Regarding claim 4, Zavracky discloses that the sacrificial layer 82 could be a copper layer (col 9, lines 49-52)

4. Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zavracky (US 5,638,964) in view of McNie et al (US 6,276,205)

Zavracky discloses a method for fabricating micromechanical switch/structure 84 suspended above a substrate (fig. 7F). This method comprises the steps of:

forming a substrate 30 (col 9, lines 20-21)

forming a polysilicon layer 80 to be removed by wet etching/ an anti-stiction layer to be removed by wet etching on the substrate (col 9, lines 46-51; fig. 7B)

forming a sacrificial layer 82 on the substrate, the layer 82 is removed by wet etchants (col 10, lines 27-30)

removing layer 80 and 82 to form a micromechanical switch having a post (col 10, lines 27-29; fig. 7F shows that layer 80 and 82 are removed to expose a part of the substrate to form a micromechanical switch having a post), which reads on removing parts of the anti-stiction layer and sacrificial layer so that a part of the substrate is exposed and forming a resulting structure including a post

forming a layer 90 over sacrificial layer 82 and anti-stiction layer 80 to form the final beam (col 10, lines 20-26; fig. 7E), which reads on forming at least one structure layer for forming at least one microstructure over the resulting structure

Art Unit: 1765

Zavracky differs from the instant claimed invention as per claim 5 by removing the polysilicon layer 80/ anti-stiction layer by wet etching instead of dry etching for preventing stiction.

However, McNie, in a method for fabricating a microelectromechanical device, teaches that polysilicon (claimed anti-stiction layer) can be etched away with wet etchant or alternately by dry etching (col 1, lines 40-41; col 4, lines 37-40). McNie also teaches that stiction problem associated with wet surface is lessened when using dry etching (col 4, lines 54-57), which reads on using dry etching for prevent stiction.

Hence, one skilled in the art would have found it obvious to modify Zavracky method by using dry etching to remove polysilicon/anti-stiction layer in view of McNie teaching because McNie teaches that the packing density of the device may be increased by the use of dry etching over that for wet etching and dry etching prevents the suspended portions of the micromechanical to stick to the other wafer or to portion of etched wafer above the cross sectional area (col 3, lines 58-60; col 4, lines 45-47)

The limitation of claim 6 has been discussed above.

Regarding claim 7, Zavracky discloses that layer 80 could be a photoresist layer/anti-stiction layer (col 9, lines 47-50)

Regarding claim 8, Zavracky discloses that the sacrificial layer 82 could be a copper layer (col 9, lines 49-52)

5. Claims 9-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zavracky (US 5,638,964) in view of McNie et al (US 6,276,205)

Art Unit: 1765

Zavracky discloses a method for fabricating micromechanical switch/structure 84 suspended above a substrate (fig. 7F). This method comprises the steps of:

forming a substrate 30 (col 9, lines 20-21)

forming a polysilicon layer 80 /anti-stiction layer on the substrate (col 9, lines 46-51; fig. 7B)

forming a sacrificial layer 82 on the polysilicon layer 80/anti-stiction (col 10, lines 27-30)

forming a layer 84 on the sacrificial layer 82 to form beam 84/microstructure (col 10, lines 7-8; fig. 7E)

removing layer 80 and 82 by wet etching to form a suspended microstructure/switch 84 (col 10, lines 27-30; fig. 7F), which reads on removing the sacrificial layer by a wet/first etching and removing the anti-stiction layer by wet etching to release the at least microstructure .

Zavracky differs from the instant claimed invention as per claim 9 by removing the polysilicon layer 80/ anti-stiction layer by wet etching instead of dry etching while preventing stiction.

However, McNie, in a method for fabricating a microelectromechanical device, teaches that polysilicon (claimed anti-stiction layer) can be etched away with wet etchant or alternately by dry etching (col 1, lines 40-41; col 4, lines 37-40). McNie also teaches that stiction problem associated with wet surface is lessened when using dry etching (col 4, lines 54-57), which reads on using dry etching while preventing stiction.

Art Unit: 1765

Hence, one skilled in the art would have found it obvious to modify Zavracky method by using dry etching to remove polysilicon/anti-stiction layer in view of McNie teaching because McNie teaches that the packing density of the device may be increased by the use of dry etching over that for wet etching and dry etching prevents the suspended portions of the micromechanical to stick to the other wafer or to portion of etched wafer above the cross sectional area (col 3, lines 58-60; col 4, lines 45-47)

The limitation of claims 10, 14 have been discussed above.

Regarding claim 11, Zavracky discloses that layer 80 could be a photoresist layer/anti-stiction layer (col 9, lines 47-50)

Regarding claim 12, Zavracky discloses that the sacrificial layer 82 could be a copper layer (col 9, lines 49-52)

The limitation of using wet etching to etch the sacrificial layer, as recited in claim 13, has been discussed above.

6. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zavracky (US 5,638,964) in view of McNie et al (US 6,276,205)

Zavracky discloses a method for fabricating micromechanical switch/structure 84 suspended above a substrate (fig. 7F). This method comprises the steps of:

forming a substrate 30 (col 9, lines 20-21)

forming a sacrificial layer 80 on the substrate (col 9, lines 46-51; fig. 7B)

forming a polysilicon layer 82/anti-stiction layer on the sacrificial layer 80 (col 9, lines 50-60; fig. 7C)

Art Unit: 1765

forming a layer 84 on the polysilicon layer 82 to form beam 84/microstructure (col 10, lines 7-8; fig. 7E)

removing layer 80 and 82 by wet etching to form a suspended microstructure/switch 84 (col 10, lines 27-30; fig. 7F), which reads on removing the sacrificial layer by wet etching and removing the anti-stiction layer by wet etching to release the at least microstructure

Zavracky differs from the instant claimed invention as per claim 15 by removing the polysilicon layer 80/ anti-stiction layer by wet etching instead of dry etching while preventing stiction.

However, McNie, in a method for fabricating a microelectromechanical device, teaches that polysilicon (claimed anti-stiction layer) can be etched away with wet etchant or alternately by dry etching (col 1, lines 40-41; col 4, lines 37-40). McNie also teaches that stiction problem associated with wet surface is lessened when using dry etching (col 4, lines 54-57), which reads on using dry etching while preventing stiction.

Hence, one skilled in the art would have found it obvious to modify Zavracky method by using dry etching to remove polysilicon/anti-stiction layer in view of McNie teaching because McNie teaches that the packing density of the device may be increased by the use of dry etching over that for wet etching and dry etching prevents the suspended portions of the micromechanical to stick to the other wafer or to portion of etched wafer above the cross sectional area (col 3, lines 58-60; col 4, lines 45-47)

Art Unit: 1765

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Hetrick et al (US 6,096,149) discloses a method for fabricating micromachine device using ACH layer to reduce sticking (col 8, lines 41-43)

Response to Arguments

8. Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection. In addition, applicant's argument that the polysilicon layer 80 of Zavracky relied on by the examiner is not an anti-stiction layer is unpersuasive because Zavracky discloses forming the polysilicon layer 80 of the same material as the claimed anti-stiction layer, Zavracky polysilicon layer 80 is also formed before stacking of a sacrificial layer 82 as the claimed anti-stiction layer. Thus the examiner asserts that Zavracky polysilicon layer 80 reads on the claimed anti-stiction layer.

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

Art Unit: 1765

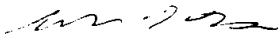
mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.


BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

LV
June 13, 2003